



## DEMANDE INTERNATIONALE PUBLIÉE EN VERTU DU TRAITE DE COOPERATION EN MATIÈRE DE BREVETS (PCT)

<b>(51) Classification internationale des brevets <sup>6</sup> :</b> <b>E04F 13/02, C04B 41/60, B32B 13/08</b>	<b>A1</b>	<b>(11) Numéro de publication internationale:</b> <b>WO 97/02395</b> <b>(43) Date de publication internationale:</b> 23 janvier 1997 (23.01.97)
<b>(21) Numéro de la demande internationale:</b> PCT/IB96/00620 <b>(22) Date de dépôt international:</b> 28 juin 1996 (28.06.96) <b>(30) Données relatives à la priorité:</b> 95/08153 30 juin 1995 (30.06.95) FR <b>(71) Déposant (pour tous les Etats désignés sauf US):</b> LAFARGE PLATRES [FR/FR]; 5, avenue de l'Egalité, F-84800 L'Isle-sur-la-Sorgue (FR). <b>(72) Inventeurs; et</b> <b>(75) Inventeurs/Déposants (US seulement):</b> ZUBER, François [FR/FR]; Villa Les-Deux-Pins, Colline Saint-Anne, F-84270 Vedène (FR). LECLERCQ, Claude [FR/FR]; Chemin des Coudoulets, F-84800 Pernes-les-Fontaines (FR). BOURNE-CHASTEL, Pascal [FR/FR]; Rue Le-Cours, F-84570 Mormoiron (FR). <b>(74) Mandataire:</b> CABINET GERMAIN & MAUREAU; Boîte postale 3011, F-69392 Lyon Cédex 03 (FR).		<b>(81) Etats désignés:</b> AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, brevet ARIPO (KE, LS, MW, SD, SZ, UG), brevet eurasien (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), brevet européen (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), brevet OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  <b>Publiée</b> <i>Avec rapport de recherche internationale.</i>
<b>(54) Title:</b> METHOD, ASSEMBLY AND COMPLEMENTARY PLASTER FOR NON-STRUCTURAL WORK <b>(54) Titre:</b> PROCEDE, ENSEMBLE ET ENDUIT COMPLEMENTAIRE DE CONSTRUCTION DE SECOND ŒUVRE <b>(57) Abstract</b> <p>A non-structural work method wherein prefabricated flat elements, particularly plates, are provided which comprise a plaster body and at least one paper facing sheet with at least one outer layer having an exposed outer surface ready for decoration, as well as at least one complementary jointing plaster particularly suitable for finishing a joint; and said flat elements are assembled, particularly by means of a plaster, whereafter the joints are finished using said complementary plaster to form an exposed outer surface that is relatively uniform even at the joints. The structure and/or composition of the paper facing sheet and the composition of the complementary plaster are adjusted in relation to one another so that when the complementary plaster has dried, a surface having one or more substantially uniform physical properties, including colour or shade, is achieved over the whole of said surface, and particularly on the exposed outer surface of the joints.</p> <b>(57) Abrégé</b> <p>Procédé de construction de second œuvre, selon lequel on dispose, d'une part, d'éléments plats préfabriqués, notamment des plaques, comportant un corps de plâtre et au moins une feuille de papier de parement, dont au moins une couche externe présente une face extérieure apparente, prête à être décorée, et d'autre part, d'au moins un enduit complémentaire de jointoiement pouvant être utilisé notamment pour la finition d'un joint et on assemble lesdits éléments plats entre eux, notamment avec un enduit, et on finit les joints avec ledit enduit complémentaire, de manière à obtenir une surface d'ensemble extérieure et apparente, relativement uniforme, y compris au niveau des joints et, la structure et/ou la composition de la feuille de papier de parement, et la composition de l'enduit complémentaire étant ajustées l'une par rapport à l'autre pour obtenir, à l'état sec de l'enduit complémentaire, une surface d'ensemble présentant une ou plusieurs caractéristiques physiques, dont la couleur ou teinte, sensiblement homogènes dans pratiquement toute la surface d'ensemble, y compris au niveau de la face extérieure apparente des joints.</p>		

Method, assembly and additional coat for the construction of interior works

Field of Invention

The present invention relates to the construction of interior works. More particularly, the invention is concerned with any construction method, involving flat prefabricated elements, especially boards, and at least one joint-pointing coat which can be used especially for the finishing of a joint. The flat prefabricated elements comprise a plaster board and at least one sheet of lining paper, at least one outer layer of which has a visible outer face ready to be decorated. The said flat elements are assembled together, especially with a coat, and the joints are finished with the said joint-pointing coat, so as to obtain an overall visible outer surface which is relatively uniform or plane, including in the region of the joints. Such a method is employed, for example, when plasterboards covered with a cardboard lining having a joint-pointing coat are assembled, for the purpose of defining spaces within a building, especially partitions.

Description of Related Art

According to the document EP-A-0,521,804, the lining paper may comprise an upper layer, called an upper web, comprising white cellulose fibres, mainly synthetic, and a mineral filler of light colour, preferably white, and a pigment layer covering the upper layer, comprising a mineral filler of light colour, preferably white, and a binder.

In general the overall visible outer surface obtained according to the above-defined method needs to be prepared, before receiving any surface decoration,

such as one or more layers of a film covering of the paint or lacquer type or a wallpaper. This preparation is necessitated especially by the shade or colour differences existing between the visible outer surface of the flat prefabricated elements, for example plasterboards, and the visible outer surface of the joints. After the interior work has been completed, this preparation involves covering the overall surface obtained, i.e. the lining of the flat prefabricated elements plus the joints, with one or more layers of a paint or priming or finishing coat.

The preparation operation represents an appreciable additional cost, for example in a complete process for the construction of a building. And in some cases, it is still insufficient for obtaining an overall decorated surface of uniform appearance, particularly in view of the physico-mechanical differences prevailing between the joints and the flat prefabricated elements.

#### Summary of Invention

The object of the present invention is to overcome the abovementioned disadvantages. More specifically, the object of the invention is a construction method breaking with the traditional approach adopted for solving the problem explained above, that is to say avoiding the need for a preparation of the overall surface, before any decoration. However, the object of the invention is a method which remains compatible with the practices of the professionals in the construction industry, especially those involved in interior works.

According to the present invention, the method differs from the traditional approach in that, the structure and/or composition of the sheet of lining paper

and the composition of the joint-pointing coat are coordinated with one another in order, in the dry state of the joint-pointing coat, to obtain an overall surface having one or more physical characteristics, including  
5 colour or shade, which are substantially homogeneous in virtually the entire overall surface, including in the region of the visible outer face of the joints.

According to other objects of the invention a construction assembly for interior works is provided,  
10 comprising, flat prefabricated elements, especially boards, and, a joint-pointing coat capable of being used especially for the finishing of a joint. The flat prefabricated elements comprise a plaster body and at least one sheet of lining paper,\* at least one outer layer  
15 of which has a visible outer face ready to be decorated. In this assembly, the structure and/or composition of the sheet of lining paper and the composition of the joint-pointing coat are coordinated with one another in order, in the dry state of the joint-pointing coat, to obtain an  
20 overall surface having one or more physical characteristics, including colour or shade, which are substantially homogeneous in virtually the entire overall surface, including in the region of the visible outer face of the joints.

25 A joint-pointing coat, intended to be used in the method or the assembly according to the invention, is also provided.

The present invention affords the following decisive advantages which result from the surface homogeneity of the overall surface obtained according to the  
30 present invention, not only in terms of colour or shade, but also in terms of particular physical or physico-

chemical characteristics.

Thus, by homogenizing the surface absorption capacity of the lining paper and of the joint-pointing coat, a virtually perfect appearance of the paint layer  
5 or paint layers and a virtually uniform adhesion of a wallpaper can be obtained. This subsequently is conducive to the homogeneous detachment of the wallpaper.

Description of the Preferred Embodiments

In a preferred version of the invention, there is  
10 a sealing coat intended for forming essentially the joints between the various flat elements, with the joint-pointing coat being a finishing coat which can be applied to the sealing coat.

According to an advantageous embodiment of the  
15 invention, when there are preexisting flat prefabricated elements, the composition of the joint-pointing coat is coordinated with the structure and/or composition of the sheet of lining paper.

According to another version of the invention,  
20 and converse to the foregoing, for a preexisting joint-pointing coat, the composition of the sheet of lining paper is coordinated with the composition of the joint-pointing coat.

Moreover, the method is more preferably characterized in that, in addition to the colour or shade, at  
25 least any one of the following physical characteristics is homogenized or matched between flat prefabricated elements and the joint-pointing coat, namely:

- the surface appearance, including reflectance;
- 30 - the absorption of surface water;
- decoloration or coloration under the effect of natural light.

Advantageously, these various physical characteristics are defined as follows:

- the reflectance factor of the overall surface, including that of the visible outer face of the joints, is between 70% and 80%, and preferably between 72% and 76%, for a wavelength of 457 nm;
- the decoloration or coloration of the overall surface, including that of the visible outer face of the joints, has a colour deviation ( $\Delta E^*$ ) at most equal to 3 after exposure for 72 hours to a source of UV radiation arranged at 15 cm from the surface and having a wavelength at least equal to 290 nm;
- the surface water absorption of the overall surface, including that of the visible outer face of the joints, is not less than 60 minutes and/or is at most equal to 15 g/m<sup>2</sup> according to the COBB test, at 23°C.

In practice, and by means of routine tests, the average person skilled in the art knows how to coordinate the structure and/or composition of a sheet of lining paper and/or the composition of a coat, so as to satisfy the above-defined technical principles. As a result, the examples described below are in no way limiting.

The present invention will now be described by taking flat prefabricated elements, plasterboards, as an example. These boards are typically composed of a factory-cast plaster body between two sheets of paper forming both its lining and its reinforcement.

Conventionally, one of the sheets of paper used for making the plasterboards has a dark colour which can vary between a grey colour and a chestnut colour, since it is composed of cellulose fibres which have not undergone any particular purifying treatment. Traditionally,

this so-called grey paper is obtained from unbleached chemical pulp and/or from mechanical pulp, and/or from thermomechanical pulp and/or from semi-chemical pulp. By mechanical pulp, it is usually meant a pulp obtained  
5 entirely by mechanical means from various raw materials, essentially wood, which can be provided by salvaged products originating from wood, such as old cardboard boxes, trimmings of kraft paper and/or old newspapers. Thermomechanical pulp means a pulp obtained by thermal  
10 treatment followed by a mechanical treatment of the raw material. By semi-chemical pulp is meant a pulp obtained by eliminating some of the non-cellulose components from the raw material by means of chemical treatment and requiring a subsequent mechanical treatment in order to  
15 disperse the fibres.

The other sheet of plasterboards has a visible face, called a lining face, of a colour generally lighter than the grey sheet. To obtain this lighter colour, the layer or layers of this face are based on chemical pulp,  
20 if appropriately bleached, composed of recycled and/or new cellulose fibres, and/or on mechanical pulp, if appropriately bleached. By chemical pulp is meant a pulp obtained by eliminating a very large proportion of the non-cellulose components from the raw material by  
25 chemical treatment, for example, by cooking in the presence of suitable chemical agents, such as soda or bisulphites. When this chemical treatment is completed by bleaching, a large part of the coloured substances is eliminated, as well as the substances which risk  
30 decomposing by ageing and giving unpleasant yellow shades associated with the presence of, for example, lignin.

In a preferred embodiment of the method of the

invention, and according to the document EP-A-0 521 804,  
the content of which is incorporated by reference, the  
lining paper comprises an upper layer, called an upper  
web, comprising white cellulose fibres, mainly synthetic,  
5 a mineral filler of light colour, preferably white, and  
a pigment layer covering the upper layer. The pigment  
layer comprises a mineral filler of light colour,  
preferably white, and a binder. Correspondingly,  
according to the present invention, the joint-pointing  
10 coat comprises a mineral filler of light colour,  
preferably white, the grain size of which is between 5  
and 35  $\mu\text{m}$ .

The fineness of the grain size of the mineral  
filler of the joint-pointing coat makes it possible to  
15 obtain a smooth surface corresponding to that of the  
lining of the board. Too large a grain size of the filler  
gives rise to overall surface defects, such as a  
reflection of light radiation on the surface of the coat  
which is different from that on the surface of the board,  
20 bringing about differences in tone and brightness of the  
shade. Too large a grain size also gives rise to  
differences in physical appearance which are associated  
with the differences in roughness between the board and  
the coat.

25 The mineral filler represents preferably between  
50% and 85% of the total weight of the joint-pointing  
coat.

Moreover, the coat can comprise a hydrophobic  
agent, for example between 0.2% and 5%, and preferably  
30 between 0.5% and 3%, of the total weight of the coat, for  
example a silicone derivative. This agent slows the  
drying kinetics of the coat, which is conducive to the

non-cracking of the coat. Also, this agent has higher resistance to the attack of steam during operations for the removal of wallpaper, so that the removal can be achieved without thereby impairing the good bonding of a paint or paper adhesive on the overall surface, including the visible surface of the joints. In fact, this hydrophobic agent makes it possible to level off the absorbent capacities of the surfaces of the coat and of the lining paper of the board. Thus, all paints or paper adhesives applied to the overall surface obtained exhibit little shift in absorption kinetics between the coat and the board, thus making it possible to avoid the appearance of spectra or of defects in shade homogeneity.

The coat also comprises an organic binder dispersible in aqueous phase, in a proportion of between 1 and 20%, and preferably between 2 and 12%, of the total weight of the joint-pointing coat, for example polyvinyl acetates and/or acrylic acid esters. The choice of this binder is important, since it must impart sufficient flexibility to the coat to withstand mechanical stresses, and it must have both an adhesive capacity for obtaining a good bond on the overall surface and good resistance to the attacks of UV light.

Moreover, a handling agent is provided in the composition of the coat, especially a water-retaining and thickening agent, for example methylhydroxyethyl-cellulose, in a proportion of 1 to 15%, and preferably of 2 to 12%, of the total weight of the joint-pointing coat.

Finally, at least one slipping agent can be included in the composition of the coat, especially a clay, in the proportion of 0.1 to 2%, and preferably of 0.1 to 0.6%, of the total weight of the joint-pointing

coat. These clays are preferably silicate derivatives and more preferably clays of the attapulgite type.

Other components, such as biocides, dispersants, anti-foaming agents and pigments can also be incorporated  
5 in the composition of the coat in the conventional way.

The invention will be understood better from the following detailed example given as a non-limiting indication.

We proceed from plasterboards similar to Example  
10 5 of document EP-A-0 521 804, which are assembled by means of a conventional sealing joint, for example a joint coat sold under the registered trade mark of "PREGYLYS"® of the Company PLATRES LAFARGE. The upper web of the lining of the board is obtained from 65% bleached  
15 synthetic cellulose fibres and 35% talcum and is covered with a pigment layer comprising, as mineral filler, 85% by weight of  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$  in the form of needles of a length of between 3 and 5  $\mu\text{m}$  and, as a binder, 10.3% by weight of styrene-butadiene copolymer. The sealing joint  
20 subsequently receives a thin layer of a joint-pointing coat according to the invention, having the following composition:

- 50 to 85% by weight of calcium carbonate, grain size from 5 to 35  $\mu\text{m}$ , as a mineral filler;
- 25 - 2 to 12% by weight of a binder comprising polyvinyl acetates and acrylic acid esters in aqueous dispersion;
- 0.5 to 3% by weight of a silicone derivative as a hydrophobic agent;
- 0.1 to 0.9% of a cellulose derivative of the  
30 methylhydroxyethylcellulose type;
- 0.1 to 0.6% of a slipping agent of the attapulgite

type;

- 1 to 12% of another silicate derivative as an additional slipping agent;
- 0.1 to 5% of a polycarboxylic acid ammonium salt as a dispersant;
- 0.001 to 0.015 of an iron oxide as a pigment;
- 0.1 to 0.3% of a preparation of N-formoles and isothiazolinones as a biocide;
- 0.1 to 0.3% of a conventional anti-foaming agent;
- water up to 100%.

The weight percentages given are in relation to the total weight of the coat, unless indicated otherwise.

For comparison requirements, standard boards conforming solely to French standard NF P 72-302 and not comprising the above-defined upper web and pigment layer are assembled by means of a joint coat for a plasterboard of the range of coats "PREGYLYS", sold by the Company PLATRES LAFARGE.

The characteristics of the two overall surfaces thus formed are compared by applying the following tests:

(A) Degree of whiteness or reflectance factor R obtained according to standard NFQ 03038 with a wavelength of 457 nm. This degree represents the percentage ratio between of a reflected radiation of the body in question and that of a perfect diffuser under the same conditions.

(B) Surface water absorption obtained, for example, according to the COBB test. In this test, a ring defining an area of 100 cm<sup>2</sup> is filled with distilled water at 23°C to a height of approximately 10 mm. The water is left in contact with the overall surface forming the bottom of the ring for one minute, and then the water

is emptied and the excess spin-dried. The weight gain of the surface is subsequently determined and brought back to an area of  $1 \text{ m}^2$ . In an alternative version, a drop of distilled water of a volume of approximately  $0.05 \text{ cm}^3$  at 5 23°C is deposited on the surface. It is important that the drop be deposited and not allowed to fall from a variable height which consequently would crush it to a greater or lesser extent, thus falsifying the result. The duration in minutes represents the surface absorption of 10 the tested area.

(C) UV radiation resistance obtained by exposing the overall surfaces, in a cabinet comprising eight high pressure mercury vapour lamps, each of 400 watts, to a wavelength which is not less than 290 nm. 15 The surfaces are maintained at a distance of 15 cm from the lamps and at a temperature of 60°C for 72 hours. The colour deviations  $\Delta E^*$  are measured on a spectrophotometer according to the standard DIN 6174 at an angle of  $8^\circ$ , illuminant D65 as a bright specular, 20 included in the system  $L^*, a^*, b^*$ , in which  $L^*$  is the luminance,  $a^*$  represents the transition from green to red, and  $b^*$  represents the transition from blue to yellow. A point  $E^*$  in this system, the said point being a function of  $L^*, a^*, b^*$ , defines the colorimetry of a 25 sample and the deviation is measured in relation to a reference point. In general terms, a colour deviation beyond 2 becomes discernible to the naked eye.

The results of the tests (A) and (B) are collated in Table I and those of the test (C) are collated in 30 Table II below.

Table I

	Standard overall surface	Overall surface according to the invention
Reflectance R (%)	Board: 50 to 60 Coat: 65 to 85	Board: 72 to 76 Coat: 72 to 76
Absorption	19	13
COBB (g/m <sup>2</sup> )	Board: 50	Board: $\geq 60$
Alternative (min)	Coat: 15	Coat: $\geq 60$

5

This shows that the overall surface according to the present invention is clearly more homogeneous than that of an assembly according to the conventional technique. Moreover, the more homogeneous absorption time of the overall surface makes it possible to use a paint having less covering capacity than that necessary with traditional boards and coats and is also beneficial to the painting operation.

10

Table II

Before Exposure	Standard	Invention
Initial measurements of the board	L* = 82.94 a* = -0.43 b* = 4.64	L* = 90.41 a* = -0.03 b* = 3.13
Initial measurements of the joint	L* = 90.70 a* = 0.73 b* = 5.28	L* = 89.70 a* = 0.50 b* = 3.60

15

15	Before Exposure	Standard	Invention
		Board/Joint colour deviation delta E' = 7.87	Board/Joint colour deviation delta E' = 1
	Exposure to UV for 72 hours		
	Measurements of the board after exposure	L* = 81.10 a* = 0.69 b* = 12.93	L* = 90.38 a* = -0.91 b* = 7.40
		Colour deviation delta E' = 8.56; very substantial yellowing plus chestnut spots	Colour deviation delta E' = 4.36; substantial yellowing
5	Measurements of the joint after exposure	L* = 88.90 a* = 0.91 b* = 3.83	L* = 89.17 a* = 0.50 b* = 3.19
		Colour deviation delta E' = 2.32; slight yellowing plus a few chestnut spots	Colour deviation delta E' = 0.67; very slight colour deviation

This table shows that the colour deviation before exposure to UV is much slighter for an overall surface according to the invention than for an overall surface such as is obtained traditionally.

This table also shows that the change in the

colour deviation after exposure to UV is much less pronounced in the overall surface according to the invention than traditionally. In fact, the colour deviation before exposure and after exposure must be  
5 as little as possible, so that the overall surface does not give the impression to the naked eye of being spotted or being covered with zones of different shade and brightness.

This is not possible with an overall surface  
10 obtained by means of traditional plasterboards and products, but the very slight deviation of the overall surface according to the invention makes it possible to mitigate this disadvantage.